

The synthesis of silver nanoparticles biology essay

[Science](#), [Biology](#)



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ABSTRACT:

The synthesis of silver nanoparticles is of great interest due to their potential application in diverse fields including catalysis, micro biocides, antimicrobial activity, etc. The present study involves the biogenic synthesis of silver Nano particles utilizing the aqueous extract of *Cassia auriculata*. The preliminary studies indicated the formation of silver nanoparticles as confirmed by the UV studies. Further application of the synthesized silver nanoparticles in organic synthesis will be explored after complete characterization including IR, XRD, and SEM techniques. Keywords: UV visible, XRD, Ag Nanoparticles, SEM, IR, *C. arriculata*.

Introduction:

Nanoparticles exhibit completely new or improved properties based on specific characteristics such as size, distribution and morphology, if compared with larger particles of the bulk material of which they are made [1]. Nanoparticles present a higher surface area with decreasing size of nanoparticles. Specific surface area is relevant for catalytic reactivity and other related properties such as antimicrobial activity in Ag nanoparticles. Properties of nanomaterials differs from the bulk materials due to change of unique physical, mechanical, optical and electromagnetic properties [2-5]. There are many methods to prepare nanoparticles like chemical reduction, electrochemical methods and photochemical reactions. But these methods mostly involve the use of toxic chemicals. Therefore there is a need for synthesis of nanoparticles using a harmless and eco-friendly route. Common eco-friendly methods use microorganisms, enzymes, plants and plant extracts. Plant extract provides an advantage over the other methods due to ease of availability, and there is no need to maintain cell cultures, this makes is a bit less tedious, and can also be used in large scale synthesis. Cassia auriculata is a plant that is mostly found in southern part of asia. It possess antipyretic [6], antidiuretic, antiperoxidative, andtihyperglycemic [7] and antimicrobial activities [8]. It contains fatty acid amides, phytols, and terepenoids, as major constituents [9]. Therefore it is used as reducing agent for synthesis of nanoparticles. Current investigation describes the synthesis of Ag nanoparticles using C. arriculata leaf extract.

Materials and Methods:

2. 1. Preparation of the plant extract:

The *C. arriculata* leaves were freshly collected and washed several times with distilled water before it is extracted. A 1 g of this plant leaves were finely chopped and stirred with 100 mL of distilled water at 80°C for 60 minutes, and filtered to get the extract. The filtrate is used as reducing agent and stabilizer.

2. 2 Preparation of Silver nanoparticles:

Silver nanoparticles were prepared by adding 2 ml of the plant extract to 50 ml of 0.01N AgNO₃ and 50 ml of 0.01N Silver acetate solution individually. It was kept undisturbed until colour change from colourless to reddish brown was observed. It was then centrifuged and the residue was washed 2 – 3 times with water. The residue was dried in air and collected. It was characterised using UV Vis, and IR and XRD and SEM. 3. Result and discussion:

UV-VIS Spectra analysis:

The reduction of pure Ag⁺ ions was monitored by measuring the UV-Vis spectrum of the reaction medium at 2 hours after diluting a small aliquot of the sample into distilled water. UV-Vis spectral analysis was done by using UV-VIS spectrophotometer UV-vis. S10AN

3. 9. FTIR Analyses of Silver nanoparticles:

FT-IR spectroscopic studies were carried out to investigate the plausible mechanism behind the formation of these silver nanoparticles and offer information regarding the functional groups. The representative spectra of

Silver nanoparticles are shown in figure. Vibrational Assignments / Functional Groups corresponding to the absorption peaks are enumerated in the figure. EXTRACT S-10AgNO₃ 30mL+ 2mL extractAg Ac 30mL+ 2mL extractAg Ac 30mL+ 2mL extract -After dilutionS10 AAS10 PES10-ANXRD: In nanoparticle preparation it is very important to control the particle size, particle shape and morphology. XRD study is most important tool used in nano materials science. A discussion about simple and low cost preparation of silver nano powder and its X-ray diffractational (XRD) studies are presented in this study. Preparation of uniformed silver nanopowder size less than 30 nm, in a normal room temperature is importance of this study. Its XRD analysis confirms the results.

CONCLUSIONS:

Plants or their extracts can be efficiently used in the synthesis of silver nanoparticles as a greener route. Control over the shape and size of nanoparticles seems to be very easy with the use of plants. Such nanoparticles produced using plants have been used in various applications for human benefit. However, the mechanism of such nanoparticle synthesis by plants is not yet fully understood. Only a few clues are available, such as the participation of phenolic, proteins and reducing agents in their synthesis. Elucidation of the mechanism of plant-mediated Synthesis of nanoparticles is a very promising area of research. Therefore, the information compiled in this article might be useful in elucidating the mechanism of nan-particle synthesis using plants as well as opening the way for exploring other plants for this purpose.